

# Government-Industry Collaboration — Developing the Army's Go-to-War Ammunition

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**T**he Ammunition Enterprise has traditionally had five major functions: continuing research and development of new ammunition, process and production engineering to iron out kinks in mass producing ammunition, preparing and maintaining drawings and specifications so arsenals can advise private industry how to better perform its job, nationwide procurement to make the best ammunition possible and ammunition manufacture and assembly oversight as required to sustain a steady munitions flow to our Soldiers. Clearly, the focus is on developing and sustaining an ammunition and firepower base that will provide U.S. forces full-spectrum dominance, regardless of where the battle takes them.

Marines prepare 81mm mortar positions just south of the Wusbin Valley, Afghanistan. The Marines are conducting security during the movement through the Wusbin Valley in support of *Operation Enduring Freedom*. (U.S. Marine Corps photo by LCPL Justin M. Mason, 2nd Marine Division Headquarters Battalion.)

Just how big is the ammunition market? Well, in FY02, the three U.S. military departments procured more than \$2.5 billion in conventional ammunition. This figure rose to more than \$3.3 billion in FY03 and will, most likely, become an even larger amount given the ongoing war on terrorism and continuing operations in Iraq and Afghanistan. The critical job of developing it all starts at the Program Executive Office for Ammunition (PEO Ammo) and the U.S. Army Armament Research, Development and Engineering Center based on user needs and combatant commander requirements. This need is met in the laboratories and research centers by the engineers, scientists and ammunition experts who work there.

### Delivering Precision Effects for Close Combat

The XM395 120mm Precision Guided Mortar Munition (PGMM) is a good example of how a critical operational need is being filled. Mortars are the maneuver commander's primary source of organic, highly responsive, indirect fire support for close combat. However, when a maneuver element encounters an obstacle, such as a bunker complex, the commander is forced to close on and defeat the enemy using direct-fire weapons, which expose his troops to enemy fire. Conventional mortar ammunition can only provide suppressive fire. In some situations, it can't be used at all because of the collateral damage probability to surrounding structures or possibility of injuring noncombatants.

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The PGMM, developed by the Product Manager (PM) for Mortar Systems Office at Picatinny Arsenal, NJ, is essentially a round of high-explosive mortar ammunition that incorporates a laser seeker and guidance/control system that will defeat personnel under protective cover (bunkers/buildings) or lightly armored vehicles in two rounds or less. *The Defense Planning Guidance Update for FYs 04-09* specifies the need to generate precision effects against "the full range of mobile targets during operations on urban terrain: enemy forces, military infrastructure, nonstate actors in urban environments and time-critical targets." *TRADOC Pamphlet 525-3-90, Objective Force (OF) Tactical Operational*

*and Organizational Concept for Maneuver Units of Action (UA)*, affirms the criticality of precision munitions in the new operational environment. PGMM will be a critical enabler for our force to defeat time-urgent, critical targets across the full spectrum of conflict in all operational environments and terrain.

While PGMM will support the close fight in all environments, its greatest contribution may be in urban and complex terrain, where it uses accuracy to achieve lethality while minimizing collateral damage. PGMM will support point target engagements requiring penetration of structures to incapacitate the enemy, defeat lightly armored vehicles in complex/urban terrain and provide a new indirect-fire capability to rapidly engage fleeting or

short-dwell material targets. Mortar units armed with PGMM will assist the UA to achieve dominance across all contingencies, from full-spectrum stability and support operations to major combat missions, while avoiding injury to noncombatants and excessive damage to designated structures.

### Reducing Risk and Producing Better Products

The XM1028 120mm Antipersonnel cartridge was based on an urgent need/requirement from U.S. Forces Korea, who were concerned about Abrams tank vulnerability. They believed the Abrams lacked sufficient firepower to kill or suppress close-in dismounted troops armed with handheld antitank weapons. Although the Abrams current ammunition suite is highly lethal against an array of targets, including dismounts, its rate of fire and coverage area are nevertheless inadequate against numerous dangerously armed ground troops.

As the user community more clearly articulated its requirements, the Project Manager for Maneuver Ammunition Systems (PM MAS) communicated these requests to several potential prime contractors. One in particular, General Dynamics Ordnance and Tactical Systems (GD-OTS), committed itself to intense market research and, after listening to the customer, began doing independent research and development (IR&D) on antipersonnel cartridges. Its concept involved the rapid expulsion of approximately 1,100 tungsten balls — a tank "shotgun shell." Metal parts, primers and combustible cartridge cases required only slight modifications. Robust testing of full-scale cartridges at government ranges quickly proved the efficacy of their technical approach and put GD-OTS in a good position to prepare its proposal.



PM MAS received highly competitive proposals from two bidders deemed responsive and capable of producing the XM1028 cartridge in sufficient quality and quantity. In the end, the GD-OTS range-proven full-scale cartridge won the development and production contract valued at more than \$25 million. To the government, technical risk was significantly reduced by GD-OTS' investment in its own IR&D program.

GD-OTS entered the systems development and demonstration phase at full pace with a producible design. GD-OTS moved quickly to consolidate its development team and put in place the processes and management controls to ensure technical performance within cost and schedule constraints. IR&D partnership dividends continued when, less than 12 months after contract award, results from a full-scale design evaluation test conclusively proved that the GD-OTS technical approach was the best option.

The XM1028 program's success resulted from a wise, but calculated, leveraging of IR&D resources, which, in turn, lowered government risk. The program remains on schedule to meet production qualification test and low-rate production milestones. The Army's acquisition objective is 16,000 cartridges to be fielded in FY05's

second quarter. The user community is expected to submit requests for even more.

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### Networked Munitions Provide Stepping Stones

The recently announced *National Landmine Policy* states the president's firm, unconditional commitment that U.S. forces will not use any persistent landmines — antitank and antipersonnel mines that do not self-destruct — after 2010. It also directs materiel developers to develop alternatives to persistent landmines. These self-destructing/self-deactivating alternatives will incorporate sophisticated network technologies to provide situational awareness and positive munition control.

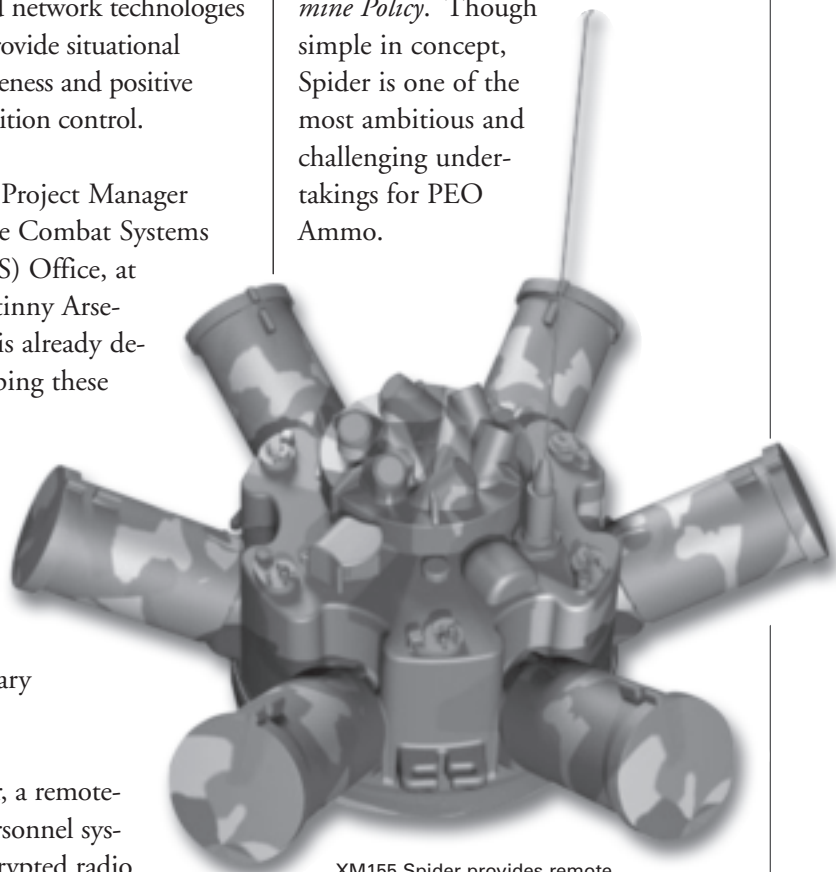
The Project Manager Close Combat Systems (CCS) Office, at Picatinny Arsenal, is already developing these

network. A Spider field detects intruders and alerts the field operator, who may then engage a hostile target or warn off a noncombatant. If enemy presence is already known or expected, the operator can command the field to operate in an autonomous mode in which individual Spider munitions detect, report and engage targets immediately. Other Spider commands include On-Off-On, command destruct and reset self-destruct time. The munition includes components such as remote control units, repeaters for extended ranges and munition control units — each with up to six antipersonnel grenades. For operational flexibility, Spider may also be used to control other lethal and nonlethal munitions as well as demolition items.

The Spider program is developing a variety of technologies that are crucial to the *National Landmine Policy*. Though simple in concept, Spider is one of the most ambitious and challenging undertakings for PEO Ammo.

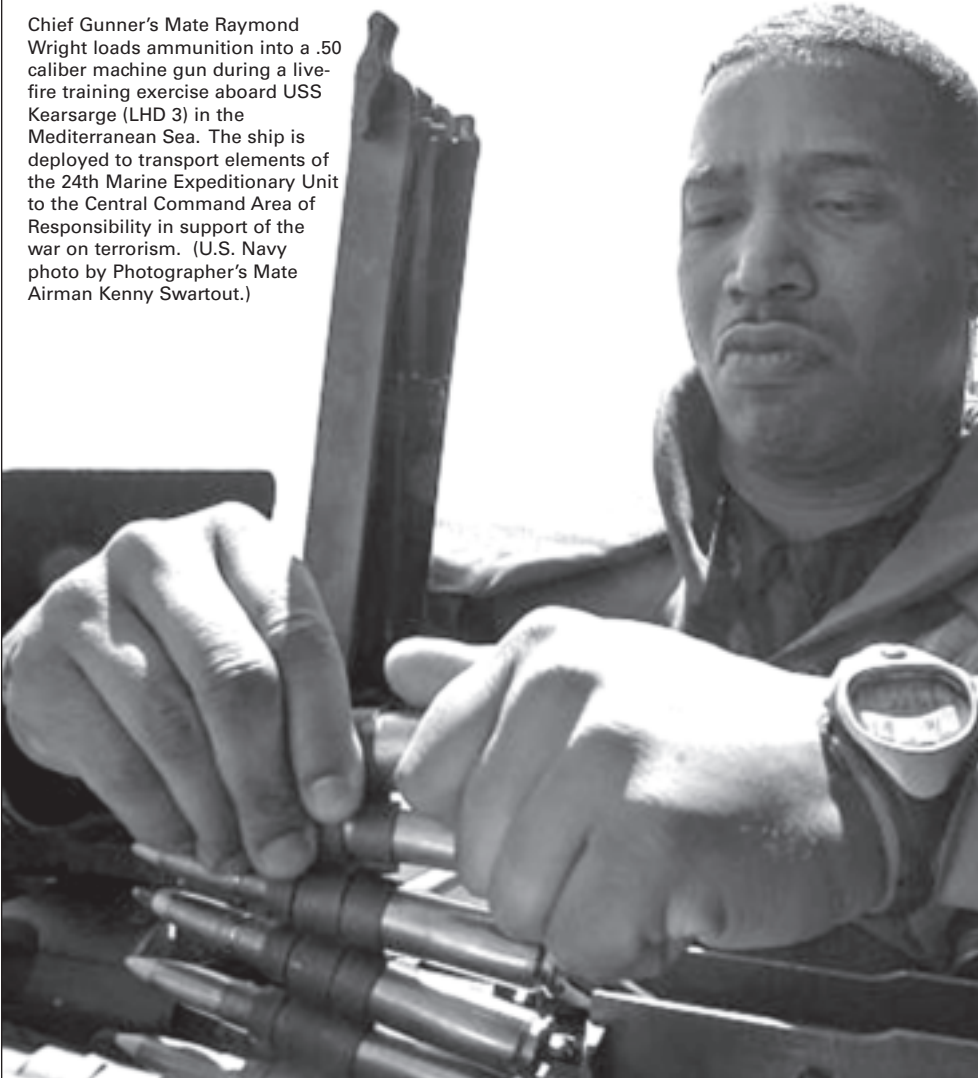
networked munitions with two complementary programs.

The first is Spider, a remote-controlled antipersonnel system that uses encrypted radio frequencies to control the munition and provide an information



XM155 Spider provides remote command and control of lethal and nonlethal munitions.

Chief Gunner's Mate Raymond Wright loads ammunition into a .50 caliber machine gun during a live-fire training exercise aboard USS Kearsarge (LHD 3) in the Mediterranean Sea. The ship is deployed to transport elements of the 24th Marine Expeditionary Unit to the Central Command Area of Responsibility in support of the war on terrorism. (U.S. Navy photo by Photographer's Mate Airman Kenny Swartout.)



Safety, communications security and network interoperability pose new technical challenges. Integrating secure communications and software with traditional explosives requires various certifications and pre-qualifications that have never before been obtained for a munitions item. Among these are the DOD Information Technology Security Certification and Accreditation Process, the Joint Tactical Radio System waiver and the Army Fuze Safety Board Review for Spider software.

If Spider is not the ultimate end state, it is a necessary stepping stone that meets the president's current timelines. The second networked munition — the Intelligent Munition System (IMS) — is being developed as a core system under

the Army's Future Combat Systems (FCS). Spider and IMS are complementary systems and both are necessary to meet the president's timelines and directives. Spider will be fully compatible with the IMS control system, while IMS will add anti-vehicle capabilities, increased situational awareness, remote deployment and full integration into FCS. As FCS technologies mature, they will be incorporated into the Spider/IMS.

With Spider and IMS, PM CCS is on the cutting edge of Army transformation. Though capable of independent employment, these networked munitions will be fully integrated into the FCS architecture. Spider and IMS will receive, process and send commands

and information. They will also engage targets directly or pass targeting information to other FCS ground systems, while continuously updating the battlespace common operating picture.

This is an exciting time for materiel developers. As the nature of warfare changes, the engineers, scientists, government employees and contractors who develop ammunition will meet challenges by taking advantage of new technologies and techniques pioneered at Picatinny Arsenal and elsewhere.

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